Agency for Healthcare Research and Quality
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NATIONAL GUIDELINE CLEARINGHOUSE

General

Guideline Title

ACR Appropriateness Criteria® headache — child.

Bibliographic Source(s)

Hayes LL, Palasis S, Bartel TT, Booth TN, Iyer RS, Jones JY, Kadom N, Milla SS, Myseros JS, Pakalnis A, Partap S, Robertson RL, Ryan ME, Saigal G, Soares BP, Tekes A, Karmazyn BK, Expert Panel on Pediatric Imaging. ACR Appropriateness CriteriaÂ® headache-child. Reston (VA): American College of Radiology (ACR); 2017. 16 p. [56 references]

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Hayes LL, Coley BD, Karmazyn B, Dempsey-Robertson ME, Dillman JR, Dory CE, Garber M, Keller MS, Kulkarni AV, Meyer JS, Milla SS, Myseros JS, Paidas C, Raske ME, Rigsby CK, Strouse PJ, Wootton-Gorges SL, Expert Panel on Pediatric Imaging. ACR Appropriateness Criteria® headache - child. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 8 p. [41 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

NEATS Assessment

National Guideline Clearinghouse (NGC) has assessed this guideline's adherence to standards of trustworthiness, derived from the Institute of Medicine's report Clinical Practice Guidelines We Can Trust.

▮▯▯▯▯= Poor ▮▮▯▯▯= Fair ▮▮▮▯▯= Good ▮▮▮▮▯= Very Good ▮▮▮▮▮= Excellent

Assessment	Standard of Trustworthiness
YES	Disclosure of Guideline Funding Source
▮▮▮▮▮	Disclosure and Management of Financial Conflict of Interests

	Guideline Development Group Composition
YES	Multidisciplinary Group
YES	Methodologist Involvement
▮▯▯▯▯	Patient and Public Perspectives
	Use of a Systematic Review of Evidence
▮▮▮▮▮	Search Strategy
▮▮▮▯▯	Study Selection
▮▮▮▮▯	Synthesis of Evidence
	Evidence Foundations for and Rating Strength of Recommendations
▮▮▯▯▯	Grading the Quality or Strength of Evidence
▮▮▮▮▮	Benefits and Harms of Recommendations
▮▮▮▮▮	Evidence Summary Supporting Recommendations
▮▮▮▮▯	Rating the Strength of Recommendations
▮▮▮▮▮	**Specific and Unambiguous Articulation of Recommendations**
▮▯▯▯▯	**External Review**
▮▮▮▯▯	**Updating**

Recommendations

Major Recommendations

ACR Appropriateness Criteria®

Headache — Child

Variant 1: Child. Primary headache. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
Arteriography cerebral	Usually Not Appropriate	☢☢☢☢
CT head with IV contrast	Usually Not Appropriate	☢☢☢
CT head without and with IV contrast	Usually Not Appropriate	☢☢☢☢
CT head without IV contrast	Usually Not Appropriate	☢☢☢
CT venography head with IV contrast	Usually Not Appropriate	☢☢☢☢
CTA head with IV contrast	Usually Not Appropriate	☢☢☢☢
MR venography head without IV contrast	Usually Not Appropriate	O

Procedure	Appropriateness Category	Relative Radiation Level
MR venography head with IV contrast	Usually Not Appropriate	O
MRA head without IV contrast	Usually Not Appropriate	O
MRI head without and with IV contrast	Usually Not Appropriate	O
MRI head without IV contrast	Usually Not Appropriate	O
X-ray skull	Usually Not Appropriate	☢☢

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Child. Secondary headache. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI head without IV contrast	Usually Appropriate	O
MRI head without and with IV contrast	Usually Appropriate	O
CT head without IV contrast	May Be Appropriate	☢☢☢
MR venography head without IV contrast	May Be Appropriate	O
MRA head without IV contrast	May Be Appropriate	O
CT venography head with IV contrast	May Be Appropriate	☢☢☢☢
CTA head with IV contrast	May Be Appropriate	☢☢☢☢
MR venography head with IV contrast	Usually Not Appropriate	O
Arteriography cerebral	Usually Not Appropriate	☢☢☢☢
CT head with IV contrast	Usually Not Appropriate	☢☢☢
CT head without and with IV contrast	Usually Not Appropriate	☢☢☢☢
X-ray skull	Usually Not Appropriate	☢☢

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Child. Sudden severe headache (thunderclap headache). Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
CT head without IV contrast	Usually Appropriate	☢☢☢
MRA head without IV contrast	Usually Appropriate	O
MRI head without IV contrast	Usually Appropriate	O
CTA head with IV contrast	May Be Appropriate	☢☢☢☢
CT head with IV contrast	Usually Not Appropriate	☢☢☢
CT head without and with IV contrast	Usually Not Appropriate	☢☢☢☢
CT venography head with IV contrast	Usually Not Appropriate	☢☢☢☢
MR venography head without IV contrast	Usually Not Appropriate	O
MRI head without and with IV contrast	Usually Not Appropriate	O
Arteriography cerebral	Usually Not Appropriate	☢☢☢☢
MR venography head with IV contrast	Usually Not Appropriate	O
X-ray skull	Usually Not Appropriate	☢☢

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Child. Headache attributed to infection. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level

Procedure	Appropriateness Category	Relative Radiation Level
MRI head without and with IV contrast	Usually Appropriate	O
CT head with IV contrast	May Be Appropriate	☢☢☢
CT head without IV contrast	May Be Appropriate	☢☢☢
MR venography head without IV contrast	May Be Appropriate	O
MR venography head with IV contrast	May Be Appropriate	O
MRA head without IV contrast	May Be Appropriate	O
MRI head without IV contrast	May Be Appropriate	O
CTA head with IV contrast	Usually Not Appropriate	☢☢☢☢
CT head without and with IV contrast	Usually Not Appropriate	☢☢☢☢
CT venography head with IV contrast	Usually Not Appropriate	☢☢☢☢
Arteriography cerebral	Usually Not Appropriate	☢☢☢☢
X-ray skull	Usually Not Appropriate	☢☢

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 5: Child. Headache attributed to remote trauma. Initial imaging.

Procedure	Appropriateness Category	Relative Radiation Level
MRI head without IV contrast	Usually Appropriate	O
CT head without IV contrast	Usually Not Appropriate	☢☢☢
CT venography head with IV contrast	Usually Not Appropriate	☢☢☢☢
CTA head with IV contrast	Usually Not Appropriate	☢☢☢☢
MR venography head with IV contrast	Usually Not Appropriate	O
MR venography head without IV contrast	Usually Not Appropriate	O
MRA head without IV contrast	Usually Not Appropriate	O
MRI head without and with IV contrast	Usually Not Appropriate	O
Arteriography cerebral	Usually Not Appropriate	☢☢☢☢
CT head with IV contrast	Usually Not Appropriate	☢☢☢
CT head without and with IV contrast	Usually Not Appropriate	☢☢☢☢
X-ray skull	Usually Not Appropriate	☢☢

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

Headache is a common complaint, even in early childhood. The prevalence of headaches increases with age and ranges from 37% to 51% for children 7 years of age and gradually increases to 57% to 82% by 15 years of age. Prepubertal boys were found to commonly experience more headaches than girls, whereas after puberty, girls were more affected.

Headaches can be either primary or secondary in nature. Primary headaches result from the headache condition itself and not from another cause. A secondary headache is a headache that is present because of another condition. Diagnosis of primary headache disorders of children rests principally on clinical criteria as defined by the International Headache Society. The evaluation of a child with headache begins with acquiring a thorough medical history and performing a physical examination with measurement of vital signs, including blood pressure, a complete neurologic examination, and examination of the optic discs.

Primary headaches, such as migraine or tension headaches that are typically chronic or recurrent, are the predominant type of headache in children. It is important to recognize that migraine headaches in young children may not meet the usual diagnostic criteria (e.g., they are usually of shorter duration than those of adults). Imaging in these patients shows a low rate (0.9%–1.2%) of clinically significant findings.

Secondary headache is more common in younger children. Most of the secondary headaches have benign etiologies. A single episode of acute headache usually results from an acute infection ranging from viral upper respiratory illness to acute meningitis. Chronic progressive headaches often indicate a serious underlying abnormality, such as a brain tumor, and children with abnormal neurological findings should undergo neuroimaging.

The clinical experiences of primary care physicians, pediatricians, and neurologists indicate that neuroimaging studies have a limited role in children with primary headaches. The high prevalence of headaches and the low yield of imaging in pediatric patients presenting with headaches alone bring into question the value of screening for patients with primary headaches. Pediatric headache literature has repeatedly reported that the value of neuroimaging in children with headache is generally low. In a study of 449 children with headache, approximately 55% of children had migraine, 30% had tension-type headaches, 10% had secondary headaches, and 5% were unspecified. Twenty-one percent of imaged children (n = 324) had abnormalities identified on their magnetic resonance imaging (MRI) examinations, largely incidental findings, with <1% having relevant findings to explain the headache, namely tumor with hydrocephalus. Similarly, another study found that even though some neurological signs were present in a substantial number of children with primary headaches, mostly migraines, the yield of brain MRI scans was still low. Therefore, the yield of brain MRI is not contributory to the diagnostic and therapeutic approach in children with primary headaches.

Based on analysis of a large body of evidence, the practice parameters authored by the American Academy of Neurology and Child Neurology Society recommend considering neuroimaging in children with an abnormal neurologic examination (e.g., focal findings, signs of increased intracranial pressure, significant alteration of consciousness), the coexistence of seizures, or both. Furthermore, neuroimaging should be considered in children in whom there are historical features to suggest the recent onset of severe headache, change in the type of headache, or if there are associated features that suggest neurologic dysfunction. Unfortunately, regardless of the evidence, imaging is often requested by the parents or physicians because the need to distinguish primary headaches from secondary headaches is often challenging and stress inducing, despite the fact that serious intracranial pathology in children is rare.

Advanced imaging modalities such as computed tomography (CT) and MRI are preferred when neuroimaging in children is considered. CT exposes children to radiation, whereas MRI sometimes requires sedation or general anesthesia, especially in children <6 years of age. Therefore, neuroimaging should be reserved for children with a suspicious clinical history, abnormal neurological findings, or other physical signs suggestive of significant intracranial pathology.

Overview of Imaging Modalities

Radiography

Radiographs have little role in the imaging of children with headache. They may be appropriate in headache attributed to head trauma (see the National Guideline Clearinghouse [NGC] summary of the ACR Appropriateness Criteria® Head trauma — child.)

MRI

MRI provides the best evaluation of the brain parenchyma and other intracranial soft tissues as well as characterization of the contents of the extra-axial spaces. In children presenting with headache and positive neurologic findings, an MRI examination will usually be more revealing than other modalities. Therefore, MRI is the preferred technique for the imaging evaluation. If an abnormality is identified on the noncontrast MRI scan, postcontrast imaging is recommended as contrast increases the sensitivity for detecting and characterizing tumor and inflammatory products. If seizures are suspected, a noncontrast

MRI should be performed as structural abnormalities do not require contrast in order to be detected (see the ACR Appropriateness Criteria® Seizures — child). If complicated sinusitis is suspected, MRI to include intravenous (IV) contrast is the preferred method of imaging. Some children, especially those under the age of 6, will require sedation for MRI.

CT

In most cases, CT is usually not the study of choice for imaging children with headaches. However, there are some cases when a CT scan of the head is indicated because of its speed and sensitivity for detecting acute blood products. In the emergency setting, if a brain tumor is suspected, CT without IV contrast can be performed initially; however, a contrast-enhanced study may be indicated if it is not possible to perform an MRI scan of the brain. In patients with thunderclap headache, subarachnoid hemorrhage (SAH) from a ruptured aneurysm or arteriovenous malformation must be excluded; therefore, a noncontrast CT scan of the head is the imaging modality of choice as it is superior to MRI in detecting acute SAH. If subarachnoid or parenchymal hemorrhage is detected, further evaluation for aneurysm or vascular malformation must be performed. This evaluation can be accomplished by CT angiography (CTA), conventional arteriography, or MR angiography (MRA).

CT is sometimes performed in the acute setting of suspected intracranial infection prior to lumbar puncture to help determine if it is safe to perform the procedure (by excluding low position of the cerebellar tonsils and excluding mass lesions or cerebral edema producing midline shift or herniation). In cases of extracranial infections, such as sinusitis, CT may be performed (see the ACR Appropriateness Criteria® Sinusitis – child). If intracranial spread of disease is suspected, CT with IV contrast that can detect suppurative fluid collections can be performed.

MRV

MR venography (MRV) is the study of choice in children with suspected venous outflow stenosis, such as those with pseudotumor cerebri, or those with venous sinus thrombosis, such as mastoiditis. MRV can be performed with or without IV contrast. MRV with contrast can be helpful in the detection of intracranial sinovenous stenosis that can go undetected because of artifactual flow voids in the transverse sinuses on traditional noncontrast (time-of-flight) MRV.

CTV

If MRV is not possible, or in cases in which the results of MRV are ambiguous, imaging with contrast-enhanced CT venography (CTV) has been found to be a fast, widely accessible alternative approach with high sensitivity and specificity in detecting venous sinus thrombosis. MRV is generally preferred over CTV because of radiation concerns.

MRA

If subarachnoid or parenchymal hemorrhage is detected, further evaluation for aneurysm or vascular malformation must be performed. This evaluation can be accomplished by MRA, CTA, or conventional arteriography. MRA can be performed without IV contrast and is easily added to a standard MRI study if a stroke or hemorrhage is detected. If there is strong concern for arterial dissection within the head and/or neck, the diagnosis is generally made by MRI or MRA.

CTA

CTA can be employed to evaluate for possible arterial dissection within the head and/or neck (see the NGC summary of the ACR Appropriateness Criteria® Cerebrovascular disease). This study requires IV contrast and can be added to the initial CT scan of the head if there is evidence of a stroke or hemorrhage.

Arteriography

In children with sudden onset of severe headache and a positive MRI or CT study demonstrating intracranial hemorrhage or stroke, digital subtraction arteriography can be performed. Arteriography is an invasive procedure that requires a skilled angiographer to be available emergently.

Discussion of Procedures by Variant

Variant 1: Child. Primary Headache. Initial Imaging

Radiography

There is no role for radiography in patients with primary headache.

MRI

In a study of 449 children with headache, approximately 55% of children had migraine, 30% had tension-type headaches, 10% had secondary headaches, and 5% were unspecified. Twenty-one percent of imaged children (n = 324) had abnormalities identified on their MRI examinations, largely incidental findings, with <1% having relevant findings to explain the headache, namely tumor with hydrocephalus. Similarly, another study found that despite findings on neurological/physical examinations in a substantial number of children with headaches, mostly migraines, the yield of brain MRI scans was low. Therefore, the yield of brain MRI is not contributory to the diagnostic and therapeutic approach. In unusual circumstances when a complete physical examination is not possible or a thorough history is not available MRI could be considered.

CT

Similar to MRI, neuroimaging with CT rarely contributes to the evaluation of children with primary headache. "Sinus headache" is a common misdiagnosis to adult and pediatric migraineurs. One study found that approximately 62% of pediatric migraineurs had at least 1 cranial autonomic symptom arising from activation of the trigeminal-autonomic reflex such as rhinorrhea, a greater percentage than is found in adults. In the pediatric patient with recurrent headaches and symptoms of sinusitis, a migraine with cranial autonomic symptoms should be considered.

CTA

There is no role for CTA in patients with primary headache and no concerning findings on clinical or physical examination.

CTV

There is no role for CTV in patients with primary headache and no concerning findings on clinical or physical examination.

MRA

There is no role for MRA in patients with primary headache and no concerning findings on clinical or physical examination.

MRV

There is no role for MRV in patients with primary headache and no concerning findings on clinical or physical examination. The use of contrast in MRV depends on institutional preferences.

Arteriography

There is no role for arteriography in patients with primary headache and no concerning findings on clinical or physical examination.

Variant 2: Child. Secondary Headache. Initial Imaging

According to the International Headache Society, secondary headaches include those attributed to head and/or neck trauma, cranial or cervical vascular disorder, nonvascular intracranial disorder, a substance or its withdrawal, infection, a disorder of homeostasis, or psychiatric disorder. Secondary headaches or facial pain can also be related to disorders of the cranium, neck, eyes, ears, nose, sinuses, teeth, mouth, or other facial or cranial structures. This discussion does not include headache attributable to acute trauma (see the NGC summaries of the ACR Appropriateness Criteria® Head trauma — child and Suspected physical abuse — child.

Radiography

Radiographs are usually not appropriate in the imaging of children with headache. They may be appropriate in headache in children with suspected head trauma (see the NGC summaries of the ACR Appropriateness Criteria® Head trauma — child and Suspected physical abuse — child.

MRI

If there are signs of increased intracranial pressure and if there is concern for possible tumor, MRI is the imaging modality of choice. Major studies addressing the issues of brain tumors and indications for imaging, including the data from 3,291 children described by the Childhood Brain Tumor Consortium, 315 children in the Boston Children's review, and 245 children in Germany, suggest that nearly all children with intracranial tumors have other symptoms or neurologic signs accompanying their headache. Symptoms depend on the location of the tumor and on the age of the patients. Increased intracranial pressure leads to an increase of head circumference in the first year of life, which might prevent a rapid development of symptoms. The data from the Childhood Brain Tumor Consortium showed that 94% of children with brain tumors had abnormal neurologic findings at diagnosis and 60% had papilledema. Other neurological findings included gait disturbance, abnormal reflexes, cranial nerve findings, and altered sensation. These studies stress the need for a meticulous neurological and ophthalmological examination. If an abnormality is detected on noncontrast MRI scan, postcontrast imaging is usually indicated.

Another diagnosis to consider in patients with headache and papilledema is pseudotumor cerebri, also known as pseudotumor cerebri syndrome (PTCS). Primary PTCS is also known as idiopathic intracranial hypertension. This disorder typically manifests as severe headaches and visual impairments and prevails in overweight females of childbearing age but can occur in obese males and prepubertal thin girls and boys. Its incidence is rising in parallel with the obesity epidemic. The etiology of pseudotumor cerebri is unclear, with impaired cerebrospinal fluid (CSF) homeostasis and altered venous hemodynamics the proposed mechanisms for elevated intracranial pressure. One study supported these mechanisms by demonstrating a reduced relative cerebral drainage through the internal jugular vein with an increased intracranial CSF volume that accumulates in the subarachnoid space.

Secondary PTCS is a result of cerebral venous abnormalities such as thrombosis, medications such as vitamin A, and medical disorders such as endocrinopathies. In cases of suspected PTCS, MRI of the brain with and without contrast should be performed as MRI is more sensitive for detection of secondary signs of increased intracranial pressure such as an empty sella, dilated optic sheaths, tortuous or enhancing optic nerves, and flattening of the posterior aspects of the globes. MRI reveals more details of the intracranial structures without radiation and is better able to evaluate for meningeal infiltration and isodense tumors over CT. In patients without PTCS, MRI should reveal normal brain parenchyma without evidence of hydrocephalus, mass, or structural lesion and no abnormal meningeal enhancement. It is important to note that meningeal enhancement can be seen on MRI following lumbar puncture and should not be confused with pathology. Imaging of the orbits including a coronal, fat-saturated T2-weighted sequence is recommended to better evaluate for dilatation of the optic sheaths.

In patients in whom there is high suspicion for Chiari I deformity, a noncontrast MRI scan of the brain to include a sagittal T2-weighted sequence of the craniocervical junction with optional phase-contrast CSF flow study at the craniocervical junction is the study of choice. The Chiari I deformity is a condition characterized by the herniation of the cerebellar tonsils through the foramen magnum with headache as its most common symptom in older children. In children <3 years of age, abnormal oropharyngeal function is commonly demonstrated. In children >3 years of age, scoliosis (associated with syringohydromyelia) or headache worsened by the Valsalva maneuver are typical findings. Most literature agrees that occipital headache in children is rare and calls for diagnostic caution; however, isolated occipital and cervical pain are not characteristic symptoms of any headache group in the pediatric age group, and their presence or absence does not correspond to changes on conventional brain MRI.

Children with sickle cell anemia are a special subgroup of patients who require particular attention as recurrent headaches and migraines in these children are common and undertreated. Low hemoglobin levels and high pain rates are associated with recurrent headaches and migraines, whereas silent cerebral infarction is not. However, acute headache in children with sickle cell anemia is more frequently associated with acute central nervous system events than in the general pediatric population, so the threshold to image these patients should be lower. These children are at risk for posterior reversible encephalopathy syndrome, especially after a bone marrow transplant, and for SAH, especially in the setting of arterial aneurysm. A history of stroke, transient ischemic attack, seizures, neurological symptoms, focal neurological examination, or elevated platelet counts at presentation warrants confirmatory imaging studies. MRI is the imaging modality of choice in these children because of its superior sensitivity for infarction and other parenchymal abnormalities.

Seizures are one of the most common secondary etiologies for headache and often have auras similar to some migraines. MRI without IV contrast is indicated in the evaluation of patients with seizures.

CT

Most often used in the emergency setting, CT may be indicated in the evaluation of children with secondary headache, especially in the setting of trauma (see the NGC summary of the ACR Appropriateness Criteria® Head trauma — child). CT without contrast may be appropriate in the screening evaluation of children with secondary headache, especially when MRI is not available. Contrast is usually not needed when screening CT is performed.

CTA

If an acute stroke is suspected, CTA in conjunction with a noncontrast CT scan of the head is indicated, with MRI/MRA the preferred modality because of its greater sensitivity in detecting acute stroke versus CT. CT should not be delayed if MRI is not available or feasible. CTA of the head and neck are usually indicated if there is strong suspicion for arterial dissection. If MRA is performed initially to evaluate for arterial dissection and is inconclusive, CTA may be helpful for further evaluation.

CTV

If there is concern for venous outflow obstruction, such as in the setting of venous sinus thrombosis or PTCS, CTV has been found to be an alternative approach with high sensitivity and specificity in detecting venous sinus thrombosis compared with MRV. MRV remains the imaging study of choice over CTV in children.

MRA

MRI is more sensitive for detecting early changes of a stroke, and a concurrent MRA plays an important role in stroke imaging. MRA is indicated for children with sickle cell anemia in the setting of headache.

MRV

In conjunction with MRI, MRV is indicated in patients with possible venous sinus abnormalities, such as those with suspected PTCS. Decreased spinal canal compliance has been identified in patients with PTCS. A study that reviewed more than 200 MRVs in suspected cases of pseudotumor cerebri found that 52% of scans showed evidence of venous obstruction in the dominant side of venous circulation. This was statistically higher than in control groups. It is important to note that reversibility of venous outflow obstruction can be seen on MRV in these patients following lumbar puncture, which argues that the presence of venous outflow obstruction could be secondary to the increased intracranial pressure itself. When cerebellar tonsillar ectopia of >5 mm is identified, imaging and clinical consideration of PTCS are warranted to avoid misdiagnosis as Chiari I. In addition to the initial MRV in patients with suspected PTCS, a second MRV following CSF drainage may be helpful. Venous sinus occlusion and arteriovenous fistulas may produce PTCS.

MRV is indicated when there is concern for venous sinus thrombosis, especially in children with intracranial extension of infection. Children with mastoiditis are at a particularly high risk for venous sinus thrombosis. Girls using oral contraceptives are also at increased risk for thrombosis. The use of contrast in MRV depends on institutional preferences. Contrast-enhanced MRV may be helpful when evaluating areas such as the sigmoid venous sinuses, a location often degraded by artifact on noncontrast MRVs.

Arteriography

In patients with evidence for stroke on CT or MRA, arteriography may be helpful for further evaluation, especially when intervention such as thrombolysis or treatment of vascular malformations is considered. Arteriography is also more sensitive in detecting small vessel disease and arterial dissection and may be a useful examination if results of MRA or CTA are unclear and there is strong suspicion for such.

Variant 3: Child. Sudden Severe Headache (Thunderclap Headache). Initial Imaging

Radiography

There is no role for radiography in children with sudden severe headache.

MRI

Sudden severe headaches, also known as "thunderclap headaches," are rare in children, and evidence for appropriate use of imaging is mainly based on experience from the adult population. Sudden severe unilateral headaches can be related to carotid or vertebral artery dissection, especially when associated with neurologic signs and symptoms (e.g., Horner syndrome). In cases of sudden onset of severe headache and when arterial dissection is suspected, the diagnosis is generally made by MRI as it is more sensitive than CT in detection of acute infarction.

Severe sudden headaches can be associated with SAH and intracranial hemorrhage that may occur with aneurysms or other vascular malformations, such as AVMs and cavernomas. Neuroimaging of children with severe or unusual head pain who have a first-degree relative with an aneurysm or other vascular abnormality is indicated, as these vascular pathologies can be familial but are otherwise uncommon. The cornerstone for the diagnosis of SAH is a noncontrast CT scan; however, the use of MRI techniques such as proton-density-weighted imaging, susceptibility-weighted imaging (SWI)/gradient-recalled echo (GRE) imaging, or T2-weighted fluid-attenuated inversion recovery (FLAIR) imaging improves the diagnosis of acute SAH, as conventional sequences are insensitive to the finding. A study found that sensitivity to SAH varied among MR sequence from 50% to 94% in acute SAH and from 33% to 100% in subacute SAH. The most sensitive sequences were FLAIR and SWI/GRE. It is important to note that signal in the sulci on the FLAIR sequence can be artifactually increased in children receiving propofol and supplemental oxygenation and can mimic SAH. Meningitis can also give this appearance.

CT

In the acute setting, noncontrast CT is indicated in the evaluation of acute thunderclap headache. The sensitivity of CT for the detection of acute SAH is greater than MRI at 98% with a specificity of 99%. CT is often the initial imaging study of choice because of availability and lack of need for sedation.

CTA

CTA may be appropriate in the setting of patients with thunderclap headache, especially if SAH is identified on noncontrast CT scan of the head. CTA is readily available in most cases and is comparable to arteriography in the evaluation of children with acute intracranial hemorrhage. In 2008, a study determined that CTA is faster, safer (i.e., better) care for patients with SAH. A 2011 meta-analysis concluded that multidetector CTA can be used as a primary examination tool in the diagnostic workup of patients with SAH. For aneurysms ≥5 mm, sensitivity of CTA is between 95% and 100% compared with between 64% and 83% for aneurysms <5 mm.

CTV

Except in cases of thunderclap headache related to an AVM, CTV is usually not indicated in patients with thunderclap headache.

MRA

MRA in conjunction with MRI is indicated in patients with thunderclap headache. In patients with suspected arterial dissection, MRA of the neck is also indicated. The sensitivity of noncontrast MRI for detecting aneurysms ≥5 mm is 85% to 100% and 56% for aneurysms <5 mm. The sensitivity increases with IV contrast.

MRV

Except in cases of thunderclap headache related to an AVM, MRV is usually not indicated in patients with thunderclap headache. The use of contrast in MRV depends on institutional preferences.

Arteriography

As an invasive and often unavailable study, arteriography is rarely the initial angiographic evaluation performed in children with thunderclap headache. A 2011 study evaluated patients that presented with intracranial hemorrhage, predominantly SAH. The findings showed that the yield from CTA and arteriography are relatively comparable, but that arteriography is superior in detection of aneurysm. Hence, in cases in which the CTA result was found to be normal despite high suspicion for lesion in the setting of SAH, a follow-up CTA or arteriography is considered useful. However, use of CTA over arteriography has been controversial. In 2007, researchers declared that because both negative and positive CTA scans mandate subsequent conventional angiography, the CTA should be dispensed with and patients should proceed directly to arteriography. Furthermore, another group of researchers declared that conventional angiography with arteriography is the ideal method for imaging these patients because of its ability to detect aneurysms quickly, reliably, and safely and that it guides the prompt proper therapy. The applicability of these adult-based studies to the pediatric population is debatable.

Variant 4: Child. Headache Attributed to Infection. Initial Imaging

Radiography

In children with headaches related to infection, radiography is usually not appropriate. Radiography is very limited in the evaluation of the paranasal sinuses, especially in children in whom the sinuses are small and the study is difficult to perform (see the ACR Appropriateness Criteria® Sinusitis — child).

MRI

In one study, the overwhelming majority of acute headaches in children and adolescents were attributable to common, minor, transient conditions, such as upper respiratory illness. Headache is the most common symptom identified with the intracranial spread of infection resulting from dural irritation and localized encephalitis. The headache can be attributed to either intracranial or extracranial infections.

In the setting of suspected intracranial infection, the need for neuroimaging is guided by laboratory tests and clinical signs. Clinical signs suggesting intracranial abnormality include high fever and change in mental status with and without focal signs. Neurologic signs and symptoms such as nuchal rigidity or alteration in consciousness may be indications for imaging. Symptoms in infants may be nonspecific, including fever, poor feeding, irritability, and lethargy. Seizures are not uncommon in these young children, mostly occurring when the inflammation has progressed to involve the brain parenchyma. Older children may have fever, headache, nausea, vomiting, confusion, stiff neck, and photophobia. Symptoms of viral meningitis can resemble those of the flu. An MRI scan of the brain is indicated in patients with signs of intracranial infection with headache. MRI with and without IV contrast is indicated in the evaluation of intracranial infections that include meningitis, encephalitis, and brain abscess. MRI may improve the sensitivity for detecting encephalitis as T2 FLAIR is sensitive for vasogenic edema, diffusion-weighted imaging is sensitive for cytotoxic edema, and postcontrast T1 and T2 FLAIR sequences are sensitive for meningeal enhancement. The combination of MRI sequences can be very helpful to exclude mimics of encephalitis, identify the extent of inflammation, and confirm if lesion distribution is concordant with symptoms. The distribution of abnormalities on MRI can help guide in determining the pathogen in some cases. For instance, brainstem and spinal cord involvement is common with enterovirus, and basal ganglia/thalamic involvement is common with West Nile virus or Japanese encephalitis. It is important to note that the classic limbic distribution of herpes simplex virus-1 may not always be present, and that extratemporal involvement is not uncommon.

Extracranial infections, including subdural empyemas (SDE) and epidural empyemas, can also be well evaluated with MRI. Epidural empyemas are collections of suppurative fluid located between the skull and dura. In infants, SDE is most commonly a complication of purulent meningitis, whereas in older children the source of SDE is typically direct extension of sinusitis or otitis media into the extracranial spaces. MRI can help identify epidural empyemas because of its ability to distinguish between different types of fluid, especially with use of diffusion-weighted imaging. Acute meningitis is a common neurological emergency and the diagnosis is usually made based on clinical and laboratory findings.

CT

Neuroimaging is reserved for specific adverse features, such as prompt diagnosis of SAH, or underlying causes, such as mastoiditis. Neurologic signs and symptoms such as nuchal rigidity or alteration in consciousness may be indications for imaging with CT. However, the sensitivity of CT in diagnosing pediatric encephalitis in comparison to MRI is generally poor. In the emergency setting, CT may be indicated in evaluating children with suspected intracranial infection, often performed prior to lumbar puncture. IV contrast is recommended in these patients if MRI is not rapidly available. A negative noncontrast CT scan of the head should not conclude the evaluation for suspected encephalitis. In one study, cranial CTs were the initial study in 94 patients, and abnormal findings were present in 22. An additional 26 children had a normal acute CT and abnormal findings identified on MRI performed within 2 days.

CT can be especially helpful in the evaluation for sinusitis and mastoiditis and may be appropriate in evaluating children with headache related to extracranial infections. Sinus disease may present with headache or may be associated with it. The diagnosis of acute sinusitis in children is made clinically; however, in children who present with severe and persistent headache as the dominant feature of sinusitis, imaging may be warranted (see the ACR Appropriateness Criteria® Sinusitis — child). Noncontrast CT scan of the paranasal sinuses is also indicated for surgical planning, usually requiring specific imaging protocols.

CTA

The role for CTA is limited in children with headache attributed to infection unless SAH or stroke is suspected and MRI/MRA is not possible.

CTV

As children with mastoiditis are at particularly high risk for venous sinus thrombosis, CTV may be helpful in the evaluation of these patients. Children with sphenoid sinusitis are also at risk for cavernous sinus thrombosis, and CTV may be helpful in these patients.

MRA

The role for MRA is limited in children with headache attributed to infection unless SAH or stroke is suspected. If arteritis is suspected, as can be seen in the setting of sphenoid sinusitis and skull base osteomyelitis, MRA may be helpful.

MRV

If venous sinus thrombosis is suspected, MRV is indicated. It should be noted, however, that in some cases of infection-induced venous sinus or cavernous sinus thrombosis, contrast-enhanced MRI could be superior to MRV as it shows the cross-sectional area of the vein with direct delineation of the thrombus itself and not just the absence of flow in the lumen, as seen on MRV. The use of contrast in MRV depends on institutional preferences.

Arteriography

There is usually no role for arteriography in the evaluation of children with headache related to infection.

Variant 5: Child. Headache Attributed to Remote Trauma. Initial Imaging

Radiography

Clearly, intracranial imaging plays a critical role in the evaluation of the acutely injured patient; however, because headache is rarely a major indication for imaging, in the context of this Appropriateness Criteria topic we will consider only the evaluation of headache related to subacute or remote trauma (see the NGC summary of the ACR Appropriateness Criteria® Head trauma — child). Radiography is not indicated in the setting of headache related to remote trauma.

MRI

Patients who have a history of subacute or remote trauma may present with headaches. Post-traumatic headache is defined as a headache that begins within 2 weeks of a closed head injury. A prospective study of children admitted with a closed head injury (minor 79%, major 21%) found that 7% of children reported chronic posttraumatic headaches, 4% had episodic tension-type headaches, and 2.5% had migraine without aura. When neurologic signs or symptoms are positive, when headaches are associated with vomiting, or when headaches are increasing in frequency, duration, or severity, regardless of the severity of the initial trauma, neuroimaging, preferably with noncontrast MRI, is indicated. SWI or GRE imaging is helpful in identifying hemosiderin deposition related to prior hemorrhage and should be included in the MRI examination. These sequences are limited because of susceptibility artifact in children with orthodontic braces or other metallic hardware, especially on higher Tesla strength MRI scanners.

CT

CT is usually not indicated in children with headaches attributed to remote trauma. A retrospective study identified 2,462 children who had minor blunt head trauma and headaches as their only symptom. None of these children had clinically important traumatic brain injuries, and only 0.7% had a traumatic brain injury identified on CT scan of the head. CT can be used if there are concerning symptoms and MRI is not possible.

CTA

Unless there is concern for a post-traumatic arterial abnormality, such as an aneurysm or arteriovenous fistula detected by CT or MRI, CTA is usually not indicated in these patients.

CTV

CTV is usually not indicated in children with headache secondary to remote trauma.

MRA

Unless there is concern for a post-traumatic arterial abnormality such as an aneurysm or arteriovenous fistula detected by CT or MRI, MRA is usually not indicated in these patients. MRA is preferred over CTA.

MRV

MRV is usually not indicated in children with headache secondary to remote trauma. The use of contrast in MRV depends on institutional preferences.

Arteriography

Arteriography is usually not indicated in children with headache secondary to remote trauma.

Summary of Recommendations

- For the initial imaging of primary headache in children, imaging is usually not appropriate.
- For the initial imaging of secondary headache in children, MRI head without IV contrast is usually appropriate, and postcontrast imaging is indicated if the noncontrast study is abnormal.
- For the initial imaging of sudden severe headache (thunderclap headache) in children, either noncontrast CT head or MRI brain is usually appropriate. Noncontrast MRA head is also usually appropriate.
- For the initial imaging of headache attributed to infection in children, MRI head with and without IV contrast is usually appropriate.
- For the initial imaging of headache attributed to remote trauma in children, MRI head without contrast is usually appropriate.

Abbreviations

- CT, computed tomography
- CTA, computed tomography angiography
- IV, intravenous
- MR, magnetic resonance
- MRA, magnetic resonance angiography
- MRI, magnetic resonance imaging

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢☢	0.1-1 mSv	0.03-0.3 mSv
☢☢☢	1-10 mSv	0.3-3 mSv
☢☢☢☢	10-30 mSv	3-10 mSv
☢☢☢☢☢	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."		

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

Headache in children, including:

- Primary headache (results from the headache condition itself and not from another cause)
- Secondary headache (headache is present because of another condition)
- Sudden severe headache (thunderclap headache)
- Headache attributed to infection
- Headache attributed to remote trauma

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Family Practice

Neurology

Pediatrics

Radiology

Intended Users

Advanced Practice Nurses

Health Care Providers

Hospitals

Managed Care Organizations

Physician Assistants

Physicians

Students

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of initial imaging procedures for children with headache

Target Population

Children with headache

Interventions and Practices Considered

1. Computed tomography (CT), head
    - Without intravenous (IV) contrast
    - With IV contrast
    - Without and with IV contrast
2. CT angiography (CTA) head with IV contrast
3. CT venography head with IV contrast
4. Magnetic resonance imaging (MRI), head
    - Without IV contrast
    - Without and with IV contrast
5. Magnetic resonance angiography (MRA), head without IV contrast
6. Magnetic resonance (MR) venography, head
    - Without IV contrast

- With IV contrast

7. Cerebral arteriography
8. X-ray skull

Major Outcomes Considered

- Utility of imaging procedures in diagnosis and evaluation of headache in children
- Sensitivity and specificity of imaging procedures in diagnosis and evaluation of headache in children

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Summary

Of the 40 citations in the original bibliography, 18 were retained in the final document.

A literature search was conducted in May 2015 and updated in November 2017 to identify additional evidence published since the *ACR Appropriateness Criteria® Headache – Child* topic was finalized. Using the search strategies described above, 687 unique articles were found. Seventeen articles were added to the bibliography. The remaining articles were not used due to either poor study design, the articles were not relevant or generalizable to the topic, or the results were unclear or biased.

The author added 16 citations from bibliographies, Web sites, or books that were not found in the literature searches, including 6 articles outside of the search date ranges.

Five citations are supporting documents that were added by staff.

Number of Source Documents

Of the 40 citations in the original bibliography, 18 were retained in the final document. The literature search conducted in May 2015 and updated on November 2017 found 17 articles that were added to the bibliography. The author added 16 citations from bibliographies, Web sites, or books that were not found in the literature searches, including 6 articles outside of the search date ranges. Five citations are supporting documents that were added by staff.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Definitions of Study Quality Categories

Category 1 - The study is well-designed and accounts for common biases.

Category 2 - The study is moderately well-designed and accounts for most common biases.

Category 3 - The study has important study design limitations.

Category 4 - The study or source is not useful as primary evidence. The article may not be a clinical study, the study design is invalid, or conclusions are based on expert consensus.

> The study does not meet the criteria for or is not a hypothesis-based clinical study (e.g., a book chapter or case report or case series description);
>
> *Or*
>
> The study may synthesize and draw conclusions about several studies such as a literature review article or book chapter but is not primary evidence;
>
> *Or*
>
> The study is an expert opinion or consensus document.

Category M - Meta-analysis studies are not rated for study quality using the study element method because the method is designed to evaluate individual studies only. An "M" for the study quality will indicate that the study quality has not been evaluated for the meta-analysis study.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author assesses the literature then drafts or revises the narrative summarizing the evidence found in the literature. American College of Radiology (ACR) staff drafts an evidence table based on the analysis of the selected literature. These tables rate the study quality for each article included in the narrative.

The expert panel reviews the narrative, evidence table and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the variant table(s). Each individual panel member assigns a rating based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Overview

The purpose of the rating rounds is to systematically and transparently determine the panels' recommendations while mitigating any undue influence of one or more panel members on another individual panel members' interpretation of the evidence. The panel member's rating is determined by reviewing the evidence presented in the Summary of Literature Review and assessing the risks or harms of performing the procedure or treatment balanced with the benefits of performing the procedure or treatment. The individual panel member ratings are used to calculate the median rating, which determines the panel's rating. The assessment of the amount of deviation of individual ratings from the panel rating determines whether there is disagreement among the panel about the rating.

The process used in the rating rounds is a modified Delphi method based on the methodology described in the RAND/UCLA Appropriateness Method User Manual.

The appropriateness is rated on an ordinal scale that uses integers from 1 to 9 grouped into three categories (see the "Rating Scheme for the Strength of the Recommendations" field).

Determining the Panel's Recommendation

- Ratings represent an individual's assessment of the risks and benefits of performing a specific procedure for a specific clinical scenario on an ordinal scale. The recommendation is the appropriateness category (i.e., "Usually appropriate", "May be appropriate", or "Usually not appropriate").
- The appropriateness category for a procedure and clinical scenario is determined by the panel's median rating without disagreement (see below for definition of disagreement). The panel's median rating is calculated after each rating round. If there is disagreement after the second rating round, the rating category is "May be appropriate (Disagreement)" with a rating of "5" so users understand the group disagreed on the final recommendation. The actual panel median rating is documented to provide additional context.
- Disagreement is defined as excessive dispersion of the individual ratings from the group (in this case, an Appropriateness Criteria [AC] panel) median as determined by comparison of the interpercentile range (IPR) and the interpercentile range adjusted for symmetry (IPRAS). In those instances when the IPR is greater than the IPRAS, there is disagreement. For a complete discussion, please refer to chapter 8 of the RAND/UCLA Appropriateness Method User Manual.
- Once the final recommendations have been determined, the panel reviews the document. If two thirds of the panel feel a final recommendation is wrong (e.g., does not accurately reflect the evidence, may negatively impact patient health, has unintended consequences that may harm health care, etc.) and the process must be started again from the beginning.

For additional information on the ratings process see the Rating Round Information document (see the "Availability of Companion Documents" field).

Additional methodology documents, including a more detailed explanation of the complete topic development process and all ACR AC topics can be found on the ACR Web site (see also the "Availability of Companion Documents" field).

Rating Scheme for the Strength of the Recommendations

Appropriateness Category Names and Definitions

Appropriateness Category Name	Appropriateness Rating	Appropriateness Category Definition
Usually Appropriate	7, 8, or 9	The imaging procedure or treatment is indicated in the specified clinical scenarios at a favorable risk-benefit ratio for patients.
May Be Appropriate	4, 5, or 6	The imaging procedure or treatment may be indicated in the specified clinical scenarios as an alternative to imaging procedures or treatments with a more favorable risk-benefit ratio, or the risk-benefit ratio for patients is equivocal.
May Be Appropriate (Disagreement)	5	The individual ratings are too dispersed from the panel median. The different label provides transparency regarding the panel's recommendation. "May be appropriate" is the rating

Appropriateness Category Name	Appropriateness Rating	Appropriateness Category Definition
		category and a rating of 5 is assigned.
Usually Not Appropriate	1, 2, or 3	The imaging procedure or treatment is unlikely to be indicated in the specified clinical scenarios, or the risk-benefit ratio for patients is likely to be unfavorable.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current medical evidence literature and the application of the RAND/UCLA appropriateness method and expert panel consensus.

Summary of Evidence

Of the 56 references cited in the *ACR Appropriateness Criteria® Headache–Child* document, 1 is categorized as a therapeutic reference. Additionally, 53 references are categorized as diagnostic references including 3 good-quality studies, and 15 quality studies that may have design limitations. There are 36 references that may not be useful as primary evidence. There are 2 references that are meta-analysis studies.

Although there are references that report on studies with design limitations, 3 well-designed or good-quality studies provide good evidence.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- Magnetic resonance imaging (MRI) provides the best evaluation of the brain parenchyma and other intracranial soft tissues as well as characterization of the contents of the extra-axial spaces. In children presenting with headache and positive neurological findings, an MRI examination will usually be more revealing than other modalities.
- In most cases, computed tomography (CT) is usually not the study of choice for imaging children with headaches. However, there are some cases when a CT scan of the head is indicated because of its speed and sensitivity for detecting acute blood products.
- Extracranial infections, including subdural empyemas (SDE) and epidural empyemas, can also be well evaluated with MRI. MRI can help identify epidural empyemas because of its ability to distinguish

between different types of fluid, especially with use of diffusion-weighted imaging.

Potential Harms

- Computed tomography (CT) exposes children to radiation, whereas magnetic resonance imaging (MRI) sometimes requires sedation or general anesthesia, especially in children <6 years of age. Therefore, neuroimaging should be reserved for children with a suspicious clinical history, abnormal neurological findings, or other physical signs suggestive of significant intracranial pathology.
- Arteriography is an invasive procedure that requires a skilled angiographer to be available emergently.

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the American College of Radiology (ACR) Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

- The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.
- ACR seeks and encourages collaboration with other organizations on the development of the ACR Appropriateness Criteria through society representation on expert panels. Participation by representatives from collaborating societies on the expert panel does not necessarily imply society endorsement of the final document.

Implementation of the Guideline

Description of Implementation Strategy

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

Hayes LL, Palasis S, Bartel TT, Booth TN, Iyer RS, Jones JY, Kadom N, Milla SS, Myseros JS, Pakalnis A, Partap S, Robertson RL, Ryan ME, Saigal G, Soares BP, Tekes A, Karmazyn BK, Expert Panel on Pediatric Imaging. ACR Appropriateness CriteriaÂ® headache-child. Reston (VA): American College of Radiology (ACR); 2017. 16 p. [56 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2017

Guideline Developer(s)

American College of Radiology - Medical Specialty Society

Source(s) of Funding

The funding for the process is assumed entirely by the American College of Radiology (ACR). ACR staff support the expert panels through the conduct of literature searches, acquisition of scientific articles, drafting of evidence tables, dissemination of materials for the Delphi process, collation of results, conference calls, document processing, and general assistance to the panelists.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Pediatric Imaging

Composition of Group That Authored the Guideline

Panel Members: Laura L. Hayes, MD (*Principal Author*); Susan Palasis, MD (*Panel Chair*); Twyla T. Bartel, DO; Timothy N. Booth, MD; Ramesh S. Iyer, MD; Jeremy Y. Jones, MD; Nadja Kadom, MD; Sarah S. Milla, MD; John S. Myseros, MD; Ann Pakalnis, MD; Sonia Partap, MD, MS; Richard L. Robertson, MD; Maura E. Ryan, MD; Gaurav Saigal, MD; Bruno P. Soares, MD; Aylin Tekes, MD; Boaz K. Karmazyn, MD (*Specialty Chair*)

Financial Disclosures/Conflicts of Interest

Disclosing Potential Conflicts of Interest and Management of Conflicts of Interest

An important aspect of committee operations is the disclosure and management of potential conflicts of interest. In 2016, the American College of Radiology (ACR) began an organization-wide review of its conflict of interest (COI) policies. The current ACR COI policy is available on its Web site. The Appropriateness Criteria (AC) program's COI process varies from the organization's current policy to accommodate the requirements for qualified provider-led entities as designated by the Centers for Medicare and Medicaid Services' Appropriate Use Criteria (AUC) program.

When physicians become participants in the AC program, welcome letters are sent to inform them of their panel roles and responsibilities, including a link to complete the COI form. The COI form requires disclosure of all potential conflicts of interest. ACR staff oversees the COI evaluation process, coordinating with review panels consisting of ACR staff and members, who determine when there is a conflict of interest and what action, if any, is appropriate. In addition to making the information publicly available, management may include exclusion from some topic processes, exclusion from a topic, or exclusion from the panel.

Besides potential COI disclosure, AC staff begins every committee call with the conflict of interest disclosure statement on the Web site reminding members to update their COI forms. If any updates to their COI information have not been submitted, they are instructed not to participate in discussion where an undisclosed conflict may exist.

Finally, all ACR AC are published as part of the Journal of the American College of Radiology (JACR) electronic supplement. Those who participated on the document and are listed as authors must complete the JACR process that includes completing the International Committee of Medical Journal Editors (ICMJE) COI form which is reviewed by the journal's staff/publisher.

The authors have no conflicts of interest related to the material discussed in this article.

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: Hayes LL, Coley BD, Karmazyn B, Dempsey-Robertson ME, Dillman JR, Dory CE, Garber M, Keller MS, Kulkarni AV, Meyer JS, Milla SS, Myseros JS, Paidas C, Raske ME, Rigsby CK, Strouse PJ, Wootton-Gorges SL, Expert Panel on Pediatric Imaging. ACR Appropriateness Criteria® headache - child. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 8 p. [41 references]

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the American College of Radiology (ACR) Web site.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2017. Available from the American College of Radiology (ACR) Web site.
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 2015 Feb. 1 p. Available from the ACR Web site.
- ACR Appropriateness Criteria®. Evidence table development. Reston (VA): American College of Radiology; 2015 Nov. 5 p. Available from the ACR Web site.
- ACR Appropriateness Criteria®. Topic development process. Reston (VA): American College of Radiology; 2015 Nov. 2 p. Available from the ACR Web site.
- ACR Appropriateness Criteria®. Rating round information. Reston (VA): American College of Radiology; 2017 Sep. 5 p. Available from the ACR Web site.
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2018. 4 p. Available from the ACR Web site.
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 2017. 125 p. Available from the ACR Web site.
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 2017 Mar. 4 p. Available from the ACR Web site.
- ACR Appropriateness Criteria® headache — child. Evidence table. Reston (VA): American College of Radiology; 2017. 20 p. Available from the ACR Web site.
- ACR Appropriateness Criteria® headache — child. Literature search summary. Reston (VA): American College of Radiology; 2017. 2 p. Available from the ACR Web site.

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI on March 30, 2006. The guideline developer agreed to not review the content. This NGC summary was updated by ECRI Institute on July 2, 2009. The guideline developer agreed to not review the content. This summary was updated by ECRI Institute on January 13, 2011 following the U.S. Food and Drug Administration (FDA) advisory on gadolinium-based contrast agents. This NGC summary was updated by ECRI Institute on August 31, 2012. The guideline developer agreed to not review the content. This summary was updated by ECRI Institute on February 15, 2017 following the U.S. Food and Drug Administration advisory on general anesthetic and sedation drugs. This NGC summary was updated by ECRI Institute on June 7, 2018. The guideline developer agreed to not review the content.

This NEATS assessment was completed by ECRI Institute on May 16, 2018. The information was verified by the guideline developer on June 7, 2018.

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